

## REMARKS

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Claims 1, 12 and 13 are amended. No new matter is added.

A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

Claims 1-9 and 11-13 are now pending in this application.

### *Rejections under 35 U.S.C. § 103*

Claims 1, 2, 5-9, and 11-13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over EP 1,174,600 A2 to Kobayashi et al. ("Kobayashi") in view of U.S. Patent No. 5,974,791 to Hirota ("Hirota") and U.S. Patent No. 6,237,326 to Russell ("Russell"). Claims 3 and 4 stand rejected under § 103(a) as being unpatentable over Kobayashi in view of Hirota and Russell, and further in view of certain legal precedent. Applicants respectfully traverse these rejections for at least the following reasons.

The device of claim 1 is configured to perform lean air-fuel ratio operation of a diesel engine when a trapped amount of particulate matter in a filter becomes sufficiently large to partially regenerate the filter, when the engine is operated with a rich air-fuel ratio for the purpose of eliminating sulfur oxide poisoning of the catalyst, and then to resume the rich air-fuel ratio operation to continue the elimination of sulfur oxide poisoning. In this regard, the device of claim 1, as amended, includes a programmable controller programmed to:

control the mechanism to cause the exhaust gas composition to be in a state corresponding to the lean air-fuel ratio, when the particulate matter trap amount has reached the predetermined amount during a period when the exhaust gas composition is in a state corresponding to the rich air-fuel ratio,

determine whether or not the particulate matter trap amount has reached a predetermined decrease state during a period when the exhaust gas composition

is in the state corresponding to the lean air-fuel ratio, the predetermined decrease state corresponding to a particulate matter trap amount smaller than the predetermined amount and larger than zero and *corresponding to the particulate matter trap being partially regenerated*, and

control the mechanism to cause the exhaust gas composition to be in a state corresponding to the rich air-fuel ratio, when the particulate matter trap amount has reached the predetermined decrease state during the period when the exhaust gas composition is in the state corresponding to the lean air-fuel ratio. (emphasis added).

The references cited in the rejection fail to suggest this combination of features of claim 1.

In contrast to claim 1, Kobayashi does not suggest controlling an air-fuel ratio mechanism to perform lean air-fuel ratio operation of a diesel engine when a trapped amount of particulate matter in a filter becomes sufficiently large to partially regenerate the filter, when the engine is operated with a rich air-fuel ratio for the purpose of eliminating sulfur oxide poisoning of the catalyst, and then to resume the rich air-fuel ratio operation to continue the elimination of sulfur oxide poisoning. The Office Action appears to recognize that Kobayashi fails to disclose this feature stating on page 4: "Kobayashi et al., however, fail to disclose that during the regeneration of the filter in step S406, the exhaust gas composition is in a state corresponding to a lean air-fuel ratio; and that the predetermined decrease state corresponds to a particulate matter trap amount smaller than the predetermined amount and larger than zero." Applicants submit that neither Hirota nor Russell cures the deficiencies of Kobayashi.

Hirota was cited for allegedly disclosing using a lean exhaust gas composition to purge particulate matter from a diesel particulate filter, but fails to cure the deficiencies of Kobayashi.

Russell also fails to cure the deficiencies of Kobayashi. Russell discloses in FIG. 7 a routine for deactivating particulate filter regeneration. When it is determined in step 710 that the filter is in regeneration, a determination is then made in step 712 as to whether stored particulate matter (spa) is less than a limit amount S4, or whether a catalyst temperature (Tc) is greater than a limit T5, or whether particulate temperature during nonregeneration

operation (Tpn) is less than limit T6 and the stored particulate amount is less than limit S6 (col. 6, lines 25-36). When the stored particulate matter is less than amount S4, i.e., when the answer to step 712 is YES, the regeneration is deactivated, and a regeneration flag unset (col. 6, lines 53-55).

Russell, however, fails to disclose that limit amount S4 corresponds to the state where the filter is partially regenerated. Instead, Russell specifically discloses that the limit amount S4 represents when the particulate filter 95 is fully regenerated, i.e., Russell discloses in col. 6, lines 37-39: "In one aspect of the present invention, limit amount S4 represents when particulate filter 95 is regenerated. Thus, the regeneration can continue until filter 95 is fully regenerated." Thus, even if there were motivation to combine Russell with Kobayashi, the combination would not suggest as in claim 1 controlling an air-fuel ratio mechanism to perform lean air-fuel ratio operation of a diesel engine when a trapped amount of particulate matter in a filter becomes sufficiently large to partially regenerate the filter, when the engine is operated with a rich air-fuel ratio for the purpose of eliminating sulfur oxide poisoning of the catalyst, and then to resume the rich air-fuel ratio operation to continue the elimination of sulfur oxide poisoning.

Moreover, one skilled in the art would not have modified Kobayashi based on the teaching of Russell in the manner suggested in the Office Action. The Office Action states on page 4, lines 16-20:

Russell teaches an engine control system with lean catalyst and particulate filter, in which a regeneration of the particulate filter (95) is terminated when a particulate matter trap amount (spa) is smaller than a predetermined amount (S4) but is larger than zero in order to prevent the exhaust gas temperature from becoming too high to cause thermal degradation to the lean catalyst (97) (lines 36-44 of column 6).

This characterization of Russell is not accurate, however. While Russell discloses terminating regeneration of the particulate filter (95) when a particulate matter trap amount (spa) is smaller than a predetermined amount (S4), there is no disclosure in Russell regarding terminating the filter regeneration according to the predetermined amount (S4) for the purpose of preventing the exhaust gas temperature from becoming too high. Russell does

disclose with respect to the temperature limit T5: "In another aspect of the present invention, temperature limit T5 represents a maximum temperature limit above which catalyst degradation can occur. Thus, regeneration is discontinued to reduce exhaust temperatures so that degradation of catalyst 97 is avoided." (col. 6, lines 39-43). Russell, however, mentions catalyst degradation due to temperature only with respect to temperature limit T5, not the limit amount S4. Thus, the motivation cited by the Examiner for modifying Kobayashi according to Russell, cannot be found in the Russell disclosure.

Moreover, even if Kobayashi were modified to include the regeneration control of Russell based on the temperature limit T5, the result would not meet the control limitations of claim 1. In claim 1, the predetermined decrease state is determined based on the particulate matter amount detected and the predetermined amount. Thus, even if regeneration is terminated in Russell such that the filter is partially regenerated during control based on the temperature limit T5, the control of Russell is based on temperature, not on a predetermined amount of particulate matter. Thus, the control of Russell is quite different from that as claimed.

Further, while Russell discloses terminating the filter regeneration in step 714, Russell does not disclose applying a rich air-fuel ratio after the termination. Thus, Russell does not suggest the recited feature of claim 1 of "control the mechanism to cause the exhaust gas composition to be in a state corresponding to the rich air-fuel ratio, when the particulate matter trap amount has reached the predetermined decrease state during the period when the exhaust gas composition is in the state corresponding to the lean air-fuel ratio."

Kobayashi and Russell also fail to suggest the advantages of the claimed control, where the predetermined decrease state corresponds to a predetermined matter amount, and to partial regeneration. As disclosed in the specification on page 13, paragraph [0064], when particulate matter is burned a little at a time, as results from the control as claimed, excessive temperature rise of the filter is prevented. Kobayashi and Russell, failing to suggest the claimed control where the predetermined decrease state corresponds to a predetermined matter amount and to partial regeneration, fail to suggest the advantages resulting therefrom.

Independent claims 12 and 13 include limitations corresponding to those discussed above with respect to claim 1, and thus are allowable for analogous reasons. Dependent claims 2-9 and 11 ultimately depend from claim 1, and are patentable for at least the same reasons, as well as for further patentable features recited therein.

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date

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By

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